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L30: Entry 3 of 14 File: USPT Mar 7, 2000

DOCUMENT-IDENTIFIER: US 6034617 A
TITLE: Operator intent based passive keyless vehicle control system

BSPR:
Automobiles traditionally have used mechanical keys and locks to protect against unauthorized access to the vehicle. However, mechanical locks are vulnerable to a criminal forcibly removing the lock cylinder, thereby being able to release the door catch without a key. Other vulnerability arises from the ability to duplicate easily most mechaincal keys.

BSPR:
A receiver in the vehicle receives the command signal from the remote control, and in response produces a receiver signal. A sensor also is located on the vehicle to detect an action by the driver which indicates an intention to operate the device. That action may involve touching a part of the vehicle such as a door handle or lock cylinder, or the driver simply being within a given distance from the vehicle. A sensor signal is produced to indicate the occurrence of that action by the driver.

DEPR:
The control circuit 14 also incorporates a mechanism which detects the proximity of a person to the motor vehicle. This mechanism may constitute a conventional proximity detector 26, such as one that transmits ultrasound, microwaves or infrared light and senses when that radiation is reflected back by an object in close proximity to the vehicle. Alternatively, the proximity sensor can be replaced by a switch 27 that closes when someone touches or operates a door handle of the vehicle. Such a switch may be a capacitive sensor at the door handle.

DEPR:
A serial output line 28 and a serial input line 29 of the controller 16 are connected to a first radio frequency transceiver 30. The first transceiver 30 modulates a standard radio frequency carrier with the serial data received on line 28 and transmits that modulated radio frequency signal via an antenna 32. The first transceiver 30 also demodulates other radio frequency signals received by the antenna 32 to recover serial digital data which then is sent via line 29 to the controller 16.

DEPR:
The first transceiver 30 is designed to communicate with a second radio frequency transceiver 40 within the remote control 12, which may have the form of a key ring fob. The second transceiver 40 has a receiver section coupled to an antenna 42. The receiver section demodulates a received radio frequency signal to recover digital data that modulates that signal and the recovered data is sent in a serial format to an input register 44. The input register 44 converts the serial data stream from the second transceiver 40 into a parallel format which is read by a control logic 46. The control logic 46 may be either a hardwired device for sequentially performing the remote control operations, or a programmable device which executes a software program to perform those operations. Control logic of this general type is similar to that used in previous types of RKE transponders and their conventional technology can be utilized to implement the functions of the present control logic 46.

DEPR:
The control logic 46 of the remote control 12 is connected to an electrically erasable programmable read only memory (EEPROM) 48 which stores codes to be

transmitted to the motor vehicle control circuit 14 when the remote control is activated. A clock circuit 52 provides timing signals for the remote control 12. A plurality of user operable switches 54 are connected to different input lines of the control logic 46 allowing the driver to select the specific functions to be performed on the motor vehicle. For example, a pair of switches can be provided for locking and unlocking the passenger doors, while another switch is for unlatching the trunk lid. In addition a motion detector 55, for example a ball in a cage type, provides an input signal to the control logic 46 whenever the remote control 12 is being moved, such as when the driver carrying the remote control is walking.

DEPR:
Digital data to be transmitted is sent by the control logic 46 in parallel form to a parallel-in/serial-out output register 56. The serial data from the output register 56 is applied to the input of a transmitter section in the second transceiver 40 which modulates a radio frequency carrier signal with that data. The resultant RF signal is sent via the antenna 42 to the control circuit 14 in motor vehicle. The components of the remote control preferably are powered by a battery (not shown).

DEPR:
If a switch closure is not detected, the process advances to step 64 where the input from the motion detector 55 in the remote control 12 is examined. If motion is not occurring, the remote control enters the sleep state at step 66. Otherwise, the process branches to step 68 at which the remote control transmits its identification code and a command indicating the passive mode. Specifically the control logic 46 in FIG. 1 obtains the identification code and the passive mode command from the EEPROM 48 and uses that data to form the message packet to send. The message packet is transferred in parallel to the output register 56 and then sent serially to the second radio frequency transceiver 40 from which the signal is transmitted via antenna 42. The second radio frequency transceiver 40 transmits the passive command signal at a lower power level at step 68 than the power level used to send the active command at step 62. This lower power level conserves the battery in the remote control 12.

DEPR:
The first of these mechanisms involves touching a door of the vehicle. For example, a switch 27, shown in FIG. 1, may be connected to the door handle to provide a signal when the driver operates that handle. This switch 27 could be a capacitive type sensor connected to the door handle to detect touching by the driver. However, it may be preferred to connect the capacitive type sensor to the lock cylinder of the door, because a driver often operates the door handle upon exiting the vehicle to ensure that the door is locked. As the remote control 12 already may have sent the passive command to the control circuit 14, the driver's test operation of the door handle will unlock and open the door when the detection mechanism is attached to the handle. Alternatively, the passive remote unlocking may be inhibited for a period of time upon the vehicle being locked.

CLPR:
14. The apparatus as recited in claim 13 wherein the sensor is a capacitive sensor connected to the part of the motor vehicle.

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L7: Entry 2 of 9 File: USPT Aug 28, 2001

DOCUMENT-IDENTIFIER: US 6282464 B1
TITLE: Technique for effectively providing audio information in a vehicle

ABPL:
In a multimedia information and control system for use in an automobile, at least one interface is employed which enables a user to access information concerning the automobile and control vehicle functions in an efficient manner. The user may select one of a plurality of displayed options on a screen of such an interface. Through audio, video and/or text media, the user is provided with information concerning the selected option and the vehicle function corresponding thereto. Having been so informed, the user may activate the selected option to control the corresponding vehicle function.

BSPR:
The invention relates generally to information and control systems and, more particularly, to a system for use in an automobile which facilitates a user's retrieval and/or dissemination of information, and control of vehicle functions.

BSPR:
In addition, local map information is important to automobile travelers moving from one locale to another. As such, navigation systems were developed to help reach their destinations in an unfamiliar milieu. One such vehicle navigation system is disclosed in U.S. Pat. No. 5,274,560 issued to LaRue. The disclosed system is based on artificial intelligence and provides a driver with directions via a voice interface. The system is built upon an optical disk player which can be used for entertainment as well. Digitized maps, compressed voice records and computer programs are stored on an optical disk compatible with the disk player. After a destination point is identified, the disclosed system finds the best route from the digitized maps and guides the driver therethrough via the voice interface, taking into account the latest traffic conditions received by an FM receiver to avoid congestion.

BSPR:
Recently, navigation systems based on military global positioning system (GPS) technology have emerged. One such navigation system is commercially available as an option for the latest model of the ACURA 3.5 RL automobile. This ACURA navigation system receives signals from a constellation of satellites which is part of the GPS. In response to these signals, the navigation system pinpoints the automobile's location (in latitude and longitude). It also detects the automobile's speed and direction. With geographic information stored on a hard disk in an onboard computer, the navigation system is capable of verbally and visually communicating to the user instructions for reaching the destination.

BSPR:
In addition to the above techniques for communications with automobile users, a technique for disseminating information regarding the automobiles themselves is disclosed in U.S. Pat. No. 5,442,553 issued to Parillo. The disclosed system is a vehicle diagnostic and software upgrade system. In this system, sensors are provided in the vehicle to generate dynamic data relating to various mechanical controls and the engine of the vehicle, including engine R.P.M., fuel/air mixture, emissions and pollution content information. A microprocessor in the vehicle has access to selectable program parameters affecting the functioning of the mechanical controls. The microprocessor collects and transmits the dynamic data to a remote diagnostic station periodically or upon its request. In response, the remote station sends, to the vehicle, signals indicative of any changes in its software and/or program parameters. The microprocessor accordingly

causes the changes to be made in the vehicle based on the received signals.

BSPR:
In addition, a technique for controlling vehicle accessories via voice command is disclosed in U.S. Pat. No. 4,827,520 issued to Zeinstra. In accordance with this technique, control functions of each accessory are formatted in a summary page for display on a screen, which is scanned by infrared light to sense any touching thereon. By uttering any of the displayed functions on the summary page, preceded by either a specified keyword or an actuation of a push-to-talk switch on a steering wheel, a more detailed subpage of the selected function is displayed for further selection by voice. As an alternative to the voice command, the selection can also be accomplished by touching the displayed function on the screen.

BSPR:
Voice command and touch screen techniques are frequently mentioned in prior art references in controlling car accessories. In particular, U.S. Pat. No. 5,214,707 issued to Fujimoto et al. discloses a system for voice-controlling equipment inside a vehicle, including microphones capable of discriminating voice commands as to whether they are generated at the driver side or at the assistant side of the vehicle in a noisy environment.

BSPR:
We have further recognized that even with the operating knowledge, many users are overwhelmed and confused with the large number of knobs, switches and buttons used to control the individual vehicle parts and accessories.

BSPR:
Accordingly, it is an object of the invention to design an information and control system for use inside an automobile with the user in mind. The user is afforded a centralized control which may be used in lieu of the knobs, switches and buttons to operate the vehicle parts and accessories. In accordance with the invention, the centralized control is intimately tied to an information system such that the user is able to efficiently access information about the functions and operations of such parts and accessories, and in a synergistic manner apply that information to operate same, using the centralized control.

BSPR:
In the preferred embodiment, when the user wants to access information about a given part or accessory of the automobile, the user is presented with options on a display screen. Each option is associated with a respective one of different parts or accessories of the automobile. The user is able to select through the interface one of the options, associated with the given automobile part or accessory. The option when selected is highlighted, for example, in yellow. A voice is then generated by the inventive system to explain the purpose or the content of the selected option before the user commits to it. Having been so informed, the user may then activate the selected option in retrieving the information of interest. The retrieved information is presented to the user in text, voice and/or graphics.

DEPR:
FIG. 1 illustrates information and control system 100 embodying the principles of the invention for use in an automobile. System 100 is referred to as the "AUTO DIRECTOR" system. It is user-friendly and designed with the automobile user in mind. For example, with AUTO DIRECTOR display interface 102a to be described, information about the automobile is readily available literally at the fingertips of the user. This information includes operational instructions, maintenance procedures, safety measures, and information about virtually every capability of the automobile. In accordance with the invention, the user is able to efficiently access such information using multimedia means involving audio, text and video media. Also with interface 102a, or multifunction display interface 102b to be described, the user is afforded a centralized control whereby he/she can program or adjust different vehicle parts and accessories using the information thus obtained.

DEPR:
As shown in FIG. 1, central to system 100 is a processor 105 connected to memory 115. Data bus 107 connects processor 105 to display interfaces 102, input interfaces 104, communications interfaces 106, output control interfaces 108, vehicle computer interfaces 110, vehicle control interfaces 112, self-test

interface 114, preferences interface 116, and audio interface 118.

DEPR:
Display interfaces 102 include, inter alia, AUTO DIRECTOR display interface 102a, which is illustrated in FIG. 2, together with control panel 205 in FIG. 1. By way of example, but not limitation, the hardware of interface 102a and control panel 205 are derived from a prior art navigation system of the type of the ACURA navigation system. In fact, interface 102a and control panel 205 are used in this illustrative embodiment to realize not only AUTO DIRECTOR functions to be described, but also the well-known navigation function.

DEPR:
Interface 102a includes a conventional liquid crystal display screen 209, and LCD driver (not shown) for processor 105 to control the display on screen 209. Interface 102a also incorporates well-known touch-screen circuitry (not shown) connected to touch screen interface 104a in FIG. 1. With this circuitry, the user can interact with processor 105 by, say, touching a displayed option on screen 209. Through interface 104a, processor 105 receives from the touch screen circuitry a signal identifying the location on screen 209 where it has been touched. If such a location matches the predetermined location of one of the displayed options, processor 105 determines that that option has been selected. With such touch-screen and displayed option selection capabilities, through AUTO DIRECTOR interface 102a, the user is able to obtain information on and control selectable functions of the automobile such as the instrument panel, navigation function, mobile phone, radio/CD player, locks, mirrors, windows, driver's seat adjustment control, climate control, windshield wipers, cruise control, lights, security function, steering, ride control, engine and transmission.

DEPR:
Specifically, multifunction display interface 102b is installed on the dashboard close to interface 102a on the driver side. Like interface 102a, interface 102b provides the user with graphic display and control of selected functions using well-known touch screen technology. In fact, interface 102b duplicates certain control functions (e.g., navigation, phone, radio and climate control) of interface 102a so that the user can use interface 102b to control a selected function while interface 102a is engaged in another ongoing function. For example, while the user is relying on AUTO DIRECTOR interface 102a to provide navigation information to reach a given destination, the user may want to adjust the climate control of the automobile. It is inconvenient for the user to terminate the ongoing navigation mode of interface 102a, albeit temporarily, to access the climate control function through the interface, adjust the climate control and then resume the navigation mode. Thus, it is preferable to leave the navigation mode of interface 102a alone and use interface 102b to administer the climate control.

DEPR:
Instrument panel display interface 102e is installed on the dashboard in front of the driver seat. This interface provides the driver with graphic display of the vehicle speed, engine RPM, outside and inside temperatures, oil pressure, fuel level, time, odometer reading, trip odometer reading and warning light indicators. Through AUTO DIRECTOR interface 102a, the system user may select the display of the information in either an analog or a digital form.

DEPR:
Input interfaces 104 comprise touch screen interface 104a and control panel 205 described before, and voice command interface 104b. The latter is connected to a microphone (not shown) and comprises standard voice command circuitry (not shown) for processing voice commands by the user through the microphone to control or modify selected functions of system 100.

DEPR:
Communications interfaces 106 include phone interface 106a, radio/CD interface 106b, television (TV) interface 106c, navigation interface 106d, and beacon interface 106e. Processor 105 interacts with and controls standard phone equipment connected to phone interface 106a. Through processor 105, the user may operate the phone equipment via voice command, thereby realizing hands-free operation of the equipment. Alternatively, the user may operate the phone equipment using the touch screen capability provided by AUTO DIRECTOR display interface 102a or multifunction display interface 102b. The user may also operate

the phone equipment via remote switches.

DEPR:
Similarly, processor 105 interacts with and controls one or more radio receivers and CD players in the automobile connected to radio/CD interface 106b. Through processor 105, the user may operate the radio receivers via voice command, remote switch and/or touch screen capability.

DEPR:
Processor 105 further interacts with and controls one or more TV receivers in the automobile connected to TV interface 106c. Again, the user may operate the TV receivers via voice command, remote switches and/or touch screen capability. It should be noted at this point that it is apparent to a person skilled in the art that wherever the touch screen capability may be used to select or control various options or functions provided by system 100, the voice command is equally applicable. As such, without further repetition, the explicit mention of use of the voice command as an alternative to that of the touch screen capability in each instance is conveniently omitted in the ensuing discussion.

DEPR:
As further described hereinbelow, navigation interface 106d is connected to a standard inertial guidance system (not shown) capable of providing gyros information, and deriving the vehicle location based on GPS information. With the map information stored in memory 115, the inertial guidance system is capable of providing the user with navigational instructions via interface 102a or 102b. Besides the locational information, local and national emergency information may be derived from the GPS information using additional standard decoding circuitry in interface 106d.

DEPR:
Window interface 108c comprises output control logic controllable by processor 105 to incrementally or completely open or close all windows, and to open, close or tilt any sunroof.

DEPR:
Cruise control interface 108h comprises output control logic controllable by processor 105 to (1) turn the cruise control on or off, (2) set the vehicle speed, and (3) cancel or resume the set speed.

DEPR:
Vehicle computer interfaces 110 include anti-lock brake computer interface 110a, engine computer interface 110b and supplemental restraint computer interface 110c for processor 105 to communicate with the computers controlling the anti-lock brakes, engine and supplemental restraints (e.g., back-up airbag deployers and seat belt tensioners), respectively. Interfaces 110 also include back-up interface 110d through which processor 105 receives and analyzes signals from the engine, anti-lock brake and supplemental restraint computers. These signals would indicate to processor 105 any failures of the computers. In response to a computer failure, processor 105 causes a corresponding back-up computer connected to interface 110d to provide a back-up function.

DEPR:
Vehicle control interfaces 112 include steering interface 112a, ride interface 112b, engine interface 112c, transmission interface 112d, traction control interface 112e, and security interface 112f.

DEPR:
Ride interface 112b comprises input monitoring and output control logic for processor 105 to lighten or stiffen the ride control to front and/or rear of vehicle in response to changing road conditions. Through interface 102a, the user may also opt for manual or automatic ride control.

DEPR:
Traction control interface 112e comprises input monitoring and output control logic providing information on whether power is delivered to front and/or rear wheels of the vehicle and what proportion of the power is delivered to each wheel. This interface also allows for manual or automatic control, and such functions as yaw control in cooperation with the anti-lock brakes and an engine cylinder shutoff.

DEPR:
Security interface 112f comprises control logic for setting a security level, and enabling or disabling a number of security related functions such as the fuel supply cut-off, motion detector, brake locking, etc. Interface 112f also allows entry of a new or alteration of an existing personal identification number (PIN) for personalization of the vehicle functions, i.e., saving the vehicle functional preferences.

DEPR:
In any event, as soon as processor 105 receives from the sensor a signal requesting an invocation of the anti-theft routine, processor 105 retrieves from navigation interface 106d GPS information identifying the parking location of the automobile, as indicated at step 251 in FIG. 3. Processor 105 then stores at step 253 the parking location GPS information in memory 115. At step 255, processor 105 determines whether the security measures remain on. By way of example, but not limitation, such determination is based on information from lock interface 108a indicating whether the driver's door is properly unlocked. If that door is properly unlocked, processor 105 determines that the security measures are called off, and the anti-theft routine comes to an end, as indicated at step 257.

DEPR:
Otherwise if processor 105 determines that the security measures remain on, processor 105 at step 259 retrieves from navigation interface 106d GPS information identifying the current location of the automobile. Processor 105 then compares at step 261 the current location GPS information with the parking location GPS information previously stored. If processor 105 at step 262 determines that the current location matches the parking location based on the comparison, the anti-theft routine returns to step 255 after a predetermined period. Otherwise if processor 105 determines that the current location does not match the parking location, processor 105 assumes that the automobile has been removed without authorization, i.e., stolen. At this point, if a conventional alarm system is connected to security interface 112f, processor 105 would cause an alarm to come on, gas to be cut off, etc.

DEPR:
In this example, a conventional transmitter (not shown) is connected to security interface 112f and transmits a predetermined sequence of signals receivable by a law enforcement agency or a suitable alarm monitor company when it is activated. Continuing the example, processor 105 translates the GPS information identifying the current vehicle location into the corresponding street address based on the map information stored in memory 115, as indicated at step 263. Processor 105 at step 265 looks up one or more phone numbers pre-stored in memory 115 for reporting to the law enforcement agency (or the alarm monitor company) about the stolen status. Alternatively, a list of phone numbers associated with law enforcement agencies (or branches of the alarm monitor company) in many different geographic locations is pre-stored, along with the GPS information identifying the locations of the respective law enforcement agencies (or alarm monitor company branches). This being so, processor 105 locates the closest law enforcement agency (or alarm monitor company branch) and its associated phone number(s) by comparing the current vehicle location GPS information with the respective agency (or branch) location GPS information.

DEPR:
In any event, processor 105 at step 267 initiates a call to a law enforcement agency (or an alarm monitor company branch) through phone interface 106a using the phone number just located. After the phone connection is established, processor 105 provides through the connection information about the current address of the vehicle using conventional voice synthesizer circuitry (not shown) in audio interface 118, and the pre-recorded information about the vehicle itself such as its vehicle identification number (VIN), model, year, color, license number, etc., as indicated at step 269. Through the same phone connection, processor 105 may also provide information about the vehicle's owner such as his/her name and contact number so that the law enforcement agency (or alarm monitor company branch) can notify the owner of the incident. Processor 105 at step 271 activates the aforementioned transmitter connected to security interface 112f to generate the predetermined sequence of signals in case the stolen vehicle is in transit. For that matter, processor 105 can also repeatedly check on the latest vehicle location and report any new address different from the one

previously reported. Thus, by tracking the signals in the vicinity of the latest reported vehicle location, the law enforcement agency (or alarm monitor company) would recover the vehicle in an efficient manner.

DEPR:
In accordance with another aspect of the invention, after processor 105 determines that the vehicle requires maintenance (e.g., based on cumulative RPM measures described below), relying on the GPS information concerning the current location of the vehicle and the GPS information identifying the locations of a predetermined list of service stations, processor 105 issues an alert to the user when it determines that the vehicle is currently within a predetermined distance from one of the service stations so that the user can conveniently drive to that nearby service station to have the vehicle serviced. To that end, the GPS information concerning the service station locations is stored in memory 115. After determining that the vehicle requires maintenance, processor 105 from time to time compares the GPS information concerning the current vehicle location with that concerning each service station in the list, thereby identifying the closest service station currently to the vehicle and the distance between them. If such a distance is within the predetermined distance, e.g., 5 miles, processor 105 causes a message to be displayed on AUTO DIRECTOR interface 102a and/or to be announced through audio interface 118 described below, informing the user about the closest service station. In addition, if interface 102a is put in a navigation mode, the GPS information concerning such a service station is used by the aforementioned inertial guidance system to direct the user there.

DEPR:
Interface 118 also processes requests from other interfaces for pre-recorded digital sounds stored in a SOUNDSGOOD library in memory 115 and routes the requested sounds to the appropriate interfaces. In addition, interface 118 comprises the conventional voice synthesizer circuitry for providing voice messages to the appropriate interfaces. Moreover, in accordance with another aspect of the invention, the voice messages and any accompanying digital sounds are routed to selected ones of speakers 289, 291a, 291b, 293a and 293b to effectively deliver the messages to the user. For instance, if the messages are extremely important, e.g., messages requiring actions to be taken immediately, to capture the full attention of the user, such messages may be routed to central speaker 289 and thereby directed toward the face of the user. If the messages are less important, e.g., advisories requiring actions to be taken sometime but not immediately, such messages may be routed to front speakers 291a and 291b. If the messages are still less important, e.g., driving tips and other messages for information only, such messages may be routed to rear speakers 293a and 293b, rendering the effect of background information.

DEPR:
Otherwise if the PIN entry is valid, processor 105 at step 305 causes interface 102a to display on screen 209 a "SELECT A FUNCTION" screen, which is illustrated in FIG. 7. As shown in FIG. 7, two options, namely, "NAVIGATION" and "QUICK TIPS", are displayed on screen 209. By default, NAVIGATION option 401 is highlighted yellow when the screen of FIG. 7 appears.

DEPR:
Thus, in this instance, the user may activate the yellow highlighted NAVIGATION option by touching the option on screen 209 or by pressing ENTER switch 205b.

DEPR:
However, if QUICK TIPS option 403 is desired, the user may touch that option on screen 209, which would then be highlighted yellow. A second touch on the same option will change the highlight to blue, indicating the active status. As an alternative, the user may utilize knob 205d of FIG. 2 to select QUICK TIPS option 403 by first pushing the knob to the right. In response, processor 105 causes the yellow highlight to move from default NAVIGATION option 401 to QUICK TIPS option 403. The user can then select the QUICK TIPS option by pressing ENTER switch 205b. Upon selection, the yellow highlighted option will again turn blue.

DEPR:
Processor 105 at step 308 detects an activation of either NAVIGATION option 401 or QUICK TIPS option 403. If NAVIGATION option 401 is activated, processor 105 at step 311 causes system 100 to enter into a navigation mode. In this mode, processor 105 causes navigational instructions to be displayed on screen 209 in a

conventional manner. In providing the navigation instructions, the standard inertial guidance system connected to navigation interface 106d receives signals from a constellation of GPS satellites maintained and controlled by the U.S. Department of Defense. In response to these signals, the inertial guidance system identifies the location (in longitude and latitude) of the automobile. The system also detects the vehicle speed, and the direction in which the vehicle is headed. By accessing the map information stored in memory 115, the system is capable of visually and verbally providing the user with directions to a given destination through AUTO DIRECTOR display interface 102a and audio interface 118, respectively.

DEPR:
By default, displayed option 609 has the "AUTO VOICE" wording thereon and is highlighted blue as the MANUFACTURER screen comes on. Accordingly, a pre-recorded voice is activated by processor 105 through audio interface 118 to read the entire text associated with this screen without interruption, including the text which is not presently shown on screen 209 but otherwise shown upon scrolling. To alter the AUTO VOICE function, the user may touch option 609 on screen 209, or alternatively press ENTER switch 205b. By doing so, the "AUTO VOICE" wording on option 609 changes to "MANUAL VOICE", which is highlighted blue, indicating its active status.

DEPR:
In accordance with the MANUAL VOICE function, a pre-recorded voice reads the displayed text only, and stops reading until additional text is scrolled onto the screen. To silence the voice, the user may again touch option 609 on screen 209, or alternatively press ENTER switch 205b. By doing so, the "MANUAL VOICE" wording on option 609 changes to "VOICE OFF", and the voice is deactivated, with the option now highlighted yellow. The cycle of the AUTO VOICE, MANUAL VOICE and VOICE OFF functions can be repeated by successively touching option 609 or pressing switch 205b.

DEPR:
As shown in FIG. 10, like the MANUFACTURER screen, the SAFETY REMINDERS screen includes option 609 displayed with the default wording "AUTO VOICE" thereon, PREVIOUS option 611, NEXT option 613, scroll-up option 605 and scroll-down option 607. This screen reminds the user of the safety features of the vehicle including, for example, air bags and seat belts. As indicated at step 329, option 611 when selected causes routine 300 to return to step 320 of FIG. 5A. Otherwise if option 613 is selected, routine 300 proceeds to step 332 where processor 105 causes a "THEFT PROTECTION FEATURES" screen to be displayed on LCD screen 209. FIG. 11 illustrates such a screen.

DEPR:
As shown in FIG. 11, the THEFT PROTECTION FEATURES screen similarly has thereon displayed options 605, 607, 609, 611 and 613. This screen describes to the user a theft-deterrent system including the anti-theft routine of FIG. 3 equipped in the vehicle. As indicated at step 335, option 611 when selected causes routine 300 to return to step 326. Otherwise if option 613 is selected, routine 300 proceeds to step 338 where processor 105 causes a "QUICK TIPS SET-UP" screen to be displayed on LCD screen 209. FIG. 12 illustrates such a screen.

DEPR:
When the MAIN MENU screen comes on, by default, DRIVER'S VIEW option 1001a is highlighted yellow, indicating that it is selected. However, the user may touch any other displayed option on screen 209 for re-selection. A further touch on the yellow highlighted option changes its color to blue and activates same. Again, the user may alternatively maneuver PUSH TO SELECT knob 205d to re-select any other displayed option, followed by a depression of ENTER switch 205b to activate the selected option. Since LCD screen 209 is compact, the display area for each option on the MAIN MENU screen is generally small. As a result, selection and activation of an option by touching the option on the screen is susceptible to errors, especially when the vehicle is in motion. Thus, in this situation it may be preferable to achieve the same result using knob 205d and switch 205b, instead.

DEPR:
In addition, because of the small display area allocated to each option on the MAIN MENU screen, the wording on the option is brief and thus tends to be

cryptic. In accordance with a feature of the invention, after a predetermined time (e.g., a few seconds) has elapsed from the option's being highlighted yellow, processor 105 causes a voice to be generated on speakers 127 to explain the purpose of the option before the user activates it. For example, after a predetermined delay from DRIVE'S VIEW option 1001a's being highlighted yellow, a voice is activated, stating the option name, followed by an explanation of the purpose of the option such as "To provide location of dash mounted components." Thus, this inventive feature affords a preview of the option before the user commits to it, thereby avoiding unnecessary backtracking.

DEPR:
Continuing the example, after hearing the preview of option 1001a, the user decides to select that option. In response, processor 105 causes a "DRIVER'S VIEW" screen to be displayed on screen 209. Such a screen is illustrated in FIG. 14. When the DRIVER'S VIEW screen appears, VOICE option 1101 is highlighted blue, indicating that voice announcements are active. To disable the voice announcements, the user may touch VOICE option 1101 on screen 209, or alternatively press ENTER switch 205b. VOICE option 1101 would be highlighted yellow when disabled.

DEPR:
As also shown in FIG. 14, a view of the interior of the automobile from the driver's perspective is provided. Underneath that view, DASH-MOUNTED CONTROLS option 1103, INSTRUMENT PANEL option 1105, AUDIO SYSTEM option 1107, CLIMATE CONTROLS option 1109 and PREVIOUS option 1111 are displayed. By default, DASH-MOUNTED CONTROLS option is highlighted yellow. However, the user in this example decides to select INSTRUMENT PANEL option 1105, instead. By touching option 1105 on screen 209, the option is highlighted yellow. If VOICE option is not disabled, after a predetermined delay, an announcement such as "To provide information on gauges, meters and warning lights" comes on to preview the purpose or content of option 1105. Options 1103, 1107, and 1109 are similarly programmed. In this instance, selecting PREVIOUS option 1111 enables the user to return to the MAIN MENU screen of FIG. 13.

DEPR:
In accordance with another feature of the invention, individual elements on the instrument panel shown in FIG. 15A are labeled with numerals "1", "2", "3", "4" and "5" which correspond to option 1201a designated "1. TACHOMETER AND WARNING LIGHTS", option 1201b designated "2. TURN SIGNAL/HAZARD WARNING", option 1201c designated "3. SPEEDOMETER AND WARNING LIGHTS", option 1201e designated "4. ODOMETER & TRIP METERS/OUTSIDE TEMPERATURE", and option 1201f designated "5. FUEL/TEMP GAUGE AND WARNING LIGHTS", respectively. As such, the function of the displayed options is two-fold. First, the wording on each displayed option informs the user of what the corresponding element(s) represents. Second, each displayed option is also for selection to obtain more information about the corresponding element(s). In addition, with the above voice preview feature, the user is further apprised of the purpose or content of the option before he/she commits to it. For example, TACHOMETER AND WARNING LIGHTS option 1201a corresponds to a voice preview such as "To provide information on tachometer and malfunction, maintenance required, low oil pressure and charging system failure indicators."

DEPR:
FIG. 16 shows VOICE option 1301 similar to option 1101 described before, TIP option 1303, a tachometer of the automobile denoted 1305, warning lights collectively denoted 1307, and options 1309a through 1309f in display segment 1311.

DEPR:
Similarly, the user may pre-select another sound segment associated with warnings. Such a sound segment should connote urgency or even emergency as such warnings include, for example, engine overheating, an extremely low fuel level caution, GPS emergency information from navigation interface 106d, etc. Under control of processor 115, audio interface 118 preempts any on-going announcement and momentarily substitute therefor any such warning as soon as it occurs, which is preceded by the associated sound segment. As mentioned before, such an emergency warning, along with the associated sound segment, is communicated to the user through central speaker 289 in FIG. 4, which is disposed directly across driver seat 295. As a result, the user is able to much appreciate the emergency

of the warning due to both of the direction from which the warning is announced and the associated sound segment preceding it.

DEPR:
In any event, if option 1303 is selected in this instance, a voice comes on and utters a tip regarding tachometer 1305 such as "To prevent engine damage, do not drive with needle in red zone." This tip is also momentarily displayed on segment 1311 in lieu of options 1309a through 1309f.

DEPR:
FIG. 18 illustrates the "CLIMATE CONTROL" screen. As shown in FIG. 18, VOICE option 1501 whose function is similar to that of option 1101 or 1301 described before is indicated in this instance using a pre-selected icon, as opposed to the word "VOICE". With the voice enabled, a first touch on any displayed option on screen 209 causes it to be highlighted yellow, indicating its selected status. A second touch causes it to be highlighted blue, indicating its active status. With the voice disabled, only one touch on any displayed option activates it.

DEPR:
The MODE options in FIG. 18 include OFF option 1511, AUTO option 1513, A/C option 1515, HEAT option 1517, and SMART CLIMATE option 1519. It should be noted that only one of the MODE options can be active at a time. In this example, assuming that the voice is enabled, when OFF option 1151 is selected by a first touch, a voice explaining the option comes on, uttering "To disable climate control." A second touch on the same option would then shut the climate control off through climate control interface 108f.

DEPR:
When AUTO option 1153 is selected by a first touch, a voice comes on to explain the option, uttering "System automatically determines air-flow distribution and volume for optimum efficiency." A second touch on the same option enables the automatic control, followed by a voice utterance, "Set desired temperature." Temperature display 1535 then flashes with the current temperature setting, prompting the user to set a desired temperature in a manner to be described.

DEPR:
If the user neglects to set a temperature after a predetermined time, in accordance with another aspect of the invention, a temperature range is automatically maintained by processor 105 in response to the date and time information from clock interface 108j, and the GPS information from navigation interface 106d. Based on the date and time information, processor 105 knows what the current season (e.g., mid-winter versus mid-summer) and time of the day (e.g., night verse noon) are. Based on the GPS information, processor 105 knows the region (e.g, New England versus Southern California) where the vehicle is. Processor 105 looks up a table stored in memory 115 containing predetermined temperature ranges corresponding to different combinations of the temporal and geographic parameters. It then prescribes an appropriate temperature range according to the table. This temperature range is updated by processor 105 periodically to reflect changes in the time of the day and the geographic location of the vehicle.

DEPR:
It should be noted that the actual realization of the temperature range as prescribed may depend on specific situations. For example, where the current temperature inside the vehicle is below the prescribed temperature range and sunlight is detected inside same, to conserve energy, processor 105 causes heaters in the vehicle to heat the vehicle compartment at a low rate, taking into account the sunlight shining through the windows of the vehicle, which helps heat the compartment due to the well known "greenhouse" effect. To that end, conventional devices sensitive to solar energy may be used to detect the presence and intensity of the sunlight inside the vehicle. Depending on the detected intensity, processor 105 accordingly adjusts the heating rates of the heaters to efficiently achieve the prescribed temperature range. In general, the higher the intensity, the lower are the heating rates.

DEPR:
SMART CLIMATE option 1519 is designed to allow the user to program the climate control for the next ride before he/she leaves the vehicle. When SMART CLIMATE option 1519 is selected by a first touch, a voice comes on to explain the option,

uttering "To enable pre-heating or pre-cooling of vehicle." A second touch on the option activates the function, followed by a voice utterance, "Set desired temperature. Set desired time using fan speed arrows." Temperature display 1535 then flashes the current temperature setting, prompting the user to set a desired temperature. Similarly, fan speed display 1541 then flashes the current date, followed by current time, prompting the user to set the date and time that the user plans to re-enter the vehicle. Through climate control interface 108f, processor 105 determines whether the current level of power from the car battery and any back-up power sources is sufficient. If it is insufficient, a message such as "Fail to pre-condition vehicle temperature" is issued through audio interface 118 to notify the user of the noncompliance. Otherwise, when it is close to the re-entry time, processor 105 determines the start-up time to effect the pre-conditioning, depending on the temperature difference between the inside and outside of the vehicle at that time. Processor 105 would then cause a combination of heaters and/or heat pumps (not shown) connected to interface 108f to pre-condition the vehicle temperature. In order to avoid substantially draining the power, in this illustrative embodiment, the requested temperature would be maintained up to an hour after the set re-entry time.

DEPR:
The Air options in FIG. 18 include FRESH option 1521 and RECIRCULATED option 1523. Only one of these two options can be active at a time. When FRESH option 1521 is selected by a first touch on the option, a voice comes on to explain the selected option, uttering "To select outside air to circulate in vehicle." A second touch on the option activates the selection to ventilate the vehicle with outside air. Similarly, RECIRCULATED option 1523 allows the user to select the inside air for recirculation in the vehicle.

DEPR:
The VENT options in FIG. 18 include FLOOR option 1525, FLOOR/DASH option 1527, DASH option 1529, DEFROST option 1531 and FLOOR/DEFROST option 1533. Only one of these five options can be active at a time. When FLOOR option 1525 is selected by a first touch on the option, a voice comes on explaining the option, uttering "Main air distribution to floor." A second touch on the option directs an air flow toward the vehicle floor.

DEPR:
The HEATERS options in FIG. 18 include SEAT option 1547, MIRROR option 1549, REAR WINDOW option 1551, STEERING WHEEL option 1553, and ALL option 1554. One or more of these options can be active at the same time. When SEAT option 1547 is selected by a first touch on the option, a voice comes on to explain the option, uttering "To enable seat heaters." A second touch on the option activates the seat heaters connected to climate control interface 108f.

DEPR:
In personalizing the vehicle, preference interface 116 monitors any user adjustments to certain vehicle functions by comparing their current settings with the corresponding stored preferences in memory 115. Thus, for example, if the user changes any of the settings relating to the climate control such as the mode, vent, air, temperature, fan speed, etc. from its previous preferred setting, preference interface 116 causes a SAVE screen to appear on screen 209. This SAVE screen is illustrated in FIG. 19. As shown in FIG. 19, the user is prompted to save the change in the setting that he/she has just made. The user at this point may activate SAVE option 1601 to change the previous preferred setting. The SAVE screen thereafter disappears in favor of the previous screen. Otherwise, he/she may activate CLOSE option 1603 to close the SAVE screen, without storing the latest setting, which is then treated as a temporary setting. In the latter case, for example, a restart of the automobile will obliterate such a temporary setting, and reinstate the stored preferred setting.

DEPR:
For example, based on the disclosure heretofore, it is apparent that through system 100, the user can run diagnostics on selected parts of the automobile by voice command or touch-screen control.

DEPR:
Further, in the disclosed embodiment, through system 100, the user is able to program the climate control for the next ride before he/she leaves the vehicle. It will be appreciated that the user will be able to achieve same remotely ahead

of time via telecommunication means. For example, processor 105 may be programmed to accept climate control commands through phone interface 106a. In that instance, the user can call from anywhere to establish a phone connection with phone interface 106a using a predetermined phone number, through which the user communicates the commands to climate control interface 108f to program the climate control. Through the phone connection, the user may be provided with climate control options described above in a synthesized voice. The user may activate one or more of such options by pressing a predetermined touch-tone key on the telephone keypad corresponding to a "yes" or "no" response. Similarly, the user may achieve the relevant temperature and/or time settings by pressing the touch-tone keys corresponding to the numerals indicative thereof. Of course, telecommunication means other than the telephone including a radio frequency (RF) transmitter may also be used to communicate the climate control commands from a remote area.

DEPR:
In addition, in the disclosed embodiment, the user may access different screens provided by AUTO DIRECTOR display interface 102a to learn about and control certain vehicle functions. It will be appreciated that a person skilled in the art will develop a demonstration program wherein a series of such screens will be automatically presented to a user in a predetermined sequence. The presentation may include commentaries, and highlights on selected options displayed on each screen. Furthermore, the presentation may be coupled with the showing of actual vehicle functions. For example, in demonstrating the climate control screen of FIG. 18, while the function of a highlighted VENT option (e.g., Floor, Floor/Dash, Dash, Defrost or Floor/Defrost) is explained, it is activated so that the user in the automobile can feel an actual air flow from the corresponding direction. The above demonstration program may be invoked using a PIN provided by the automobile manufacturer. The program may run continually while the automobile is shown in a showroom, or may be invoked by the user occasionally to obtain relevant information.

DEPR:
Moreover, other features of system 100 may include capabilities of communications with a third party remote from the vehicle. For example, system 100 may be programmed to transmit signals representing data on the current speed of the vehicle and its VIN receivable by a radar system, thus enabling the third party to monitor its speed. Furthermore, system 100 may be programmed by the third party to disable and subsequently enable the vehicle upon successful verification of a PIN pre-assigned to the third party. To that end, system 100 is capable of receiving remote transmission of the PIN, followed by the disable or enable code. The transmission may be encrypted for security reasons. Furthermore, more than one PIN may be used for different purposes. For example, a PIN may be assigned to a law enforcement agency to disable the vehicle because of a suspension of a license, or to temporarily disable the vehicle when the driver is intoxicated. Another PIN may be assigned to an environmental protection agency to disable the vehicle for failing to meet the emission requirements. Yet another PIN may be assigned to the vehicle owner to disable the vehicle when parked, thereby reducing the risk of a car theft. The disabling of the vehicle involves cutting off its gas, putting on its anti-lock brakes, etc.

DEPR:
Moreover, in the disclosed embodiment, system 100 is illustratively used in an automobile. It will be appreciated that a person skilled in the art may also employ the inventive system in another type of vehicle such as a boat, an airplane, etc.

CLPR:
1. A system for providing messages of varying importance levels in a vehicle comprising:

CLPR:
3. The system claim 1 wherein the group of audio output devices includes at least one audio output device disposed opposite a seat in the vehicle such that the message is provided toward a front part of a person occupying the seat.

CLPR:
5. The system of claim 3 wherein a second group of audio output devices includes at least a second audio output device disposed behind the seat in the vehicle,

the message being more important than a second message provided using the at least second audio output device.

CLPR:
6. The system of claim 3 wherein a second group of audio output devices includes at least a second audio output device disposed on a door in the vehicle, the message being more important than a second message provided using the at least second audio output device.

CLPR:
8. A method for use in a system for providing messages of varying importance levels in a vehicle, the system including a plurality of audio output devices for providing the messages, the audio output devices being disposed in different areas in the vehicle, the method comprising:

CLPR:
9. The method of claim 8 wherein the group of audio output devices includes at least one audio output device disposed opposite a seat in the vehicle such that the message is provided toward a front part of a person occupying the seat.

CLPR:
11. The method of claim 9 wherein a second group of audio output devices includes at least a second audio output device disposed on a door in the vehicle, the message being more important than a second message provided using the at least second audio output device.

CLPR:
13. The method of claim 9 wherein a second group of audio output devices includes at least a second audio output device disposed behind the seat in the vehicle, the message being more important than a second message provided using the at least second audio output device.

CLPV:
a plurality of audio output devices for providing the messages, the audio output devices being disposed in different areas in the vehicle; and